PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

PERMIT SUMMARY SHEET

Permit No.: 1490001, C-9842

Source Name: Westar Energy, Inc. – Jeffrey Energy Center

Source Location: 25905 Jeffrey Road, St. Mary's, Kansas 66536

I. Area Designation

K.A.R. 28-19-350, Prevention of significant deterioration of air quality, affects new major sources and major modifications to major sources in areas designated as "attainment" or "unclassifiable" under section 107 of the Clean Air Act (CAA) for any criteria pollutant. The State of Kansas is classified as attainment for the National Ambient Air Quality Standards (NAAQS) for all the criteria pollutants.

The St. Mary's area in Pottawatomie County, Kansas, where this modification is taking place, is currently in attainment or unclassifiable for all criteria pollutants. As such, the PSD program, as administered by the State of Kansas under K.A.R. 28-19-350, will apply to the proposed project.

II. Project Description

Westar Energy, Inc. (Westar) owns and operates the Jeffrey Energy Center (JEC), an existing coal-fired electric generating plant located in St. Mary's, Kansas. Westar is proposing to initiate an emission reduction project on Unit 3 (JEC3). JEC 3 is a Combustion Engineering steam boiler with a heat input of 8,262 MMBtu/hr, equipped with low NOx burners and separated overfire air (SOFA).

Westar plans to reduce NO_X emissions on JEC3 by upgrading and enhancing the existing low NOx system, adjusting the existing SOFA and adding additional SOFA. The existing low NOx burners will have their burner tips (auxiliary air tips, oil gun tips and coal nozzle tips) replaced with new components. The bottom three stationary coal nozzles in each corner will also be replaced with new horizontal bias combustion burners. In addition to the adjustments to the existing SOFA, new SOFA will be added for deeper staging. A substantial amount of new ductwork will be added to accommodate the overfire air port modifications.

III. Significant Applicable Air Emission Regulations

This source is subject to Kansas Administrative Regulations relating to air pollution control. The application for this permit was reviewed and evaluated for compliance with the following applicable regulations:

A. K.A.R. 28-19-300. Construction Permits and Approvals; Applicability. "Any person who proposes to construct or modify a stationary source or emissions unit shall obtain a construction permit before commencing such construction or modification."

B. K.A.R. 28-19-350. Prevention of significant deterioration of air quality. "The provisions of K.A.R. 28-19-350 shall apply to the construction of major stationary sources and major modifications of major stationary sources in the areas of the state designated as an attainment area or an unclassified area for any pollutant under the procedures prescribed by section 107(d) of the federal clean air act (42 U.S.C. 7407 (d))."

IV. Air Emissions from the Project

The potential-to-emit of one of the PSD regulated pollutants from the existing JEC exceeds 100 tons per year. Hence, the facility is considered to be a major stationary source under provisions of K.A.R. 28-19-350.

The total projected emissions increases from the proposed project are listed in Table 1 of Section 1 and detailed out in Appendix B of the application. Proposed projected emissions increases of carbon monoxide (CO), oxides of nitrogen (NO_x) and carbon dioxide (CO_2) were compared with the Significant Emission Rates for PSD applicability for the criteria and non-criteria pollutants. The projected emissions increase is above the PSD significance level for CO and will be reviewed under the PSD regulations. NO_x emissions will be reduced under this modification. CO_2 emissions will also be reduced under this project.

This project will be a major modification of an existing major stationary source resulting in a net significant increase of CO. This project will be subject to the various aspects of K.A.R. 28-19-350, such as the use of best available control technology (BACT), ambient air quality analysis, and additional impacts upon soils, vegetation and visibility. Good combustion practices were selected as BACT for CO with a limitation of 0.40 lb/MMBtu. Compliance with the CO limitation will be determined with a continuous emission monitor system (CEMS).

The proposed NO_x emissions reduction project is described in Section 2 of the application. The air emissions estimates are shown in the table below:

Pollutant Type	Baseline Actual (tons per year)	Projected Actual (tons per year)	Change in Emissions (tons per year)
CO	4,213	10,634	6,421
NO_X	4,521	3,722	-799
CO_2	5,502,851	5,492,763	-10,088

On June 3, 2010, the U.S. Environmental Protection Agency (EPA) issued the final Greenhouse Gas (GHG) Tailoring Rule (75 FR 31514). This rule established the thresholds for GHG emissions under the PSD permit program for new and existing industrial facilities. GHGs are a single air pollutant defined as the aggregate group of the following six gases:

- carbon dioxide (CO_2)
- nitrous oxide (N_2O)
- methane (CH_4)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulfur hexafluoride (SF_6)

Starting in January 2011, sources currently subject to the PSD permitting program (i.e., those that are newly-constructed or modified in a way that significantly increases emissions of a pollutant other than GHGs) are subject to permitting requirements for their GHG emissions under PSD. For those affected facilities, only GHG emissions increases of 75,000 tpy or more of total GHG, on a carbon dioxide equivalent (CO_2e) basis, need to determine the Best Available Control Technology (BACT) for their GHG emissions.

PSD does not apply to the GHG emissions from this proposed project. Even though the proposed modification is considered a major modification under the PSD permit program and Westar is required to obtain a PSD permit (called an "anyway source"), there is no potential emissions increase of GHGs from the modification.

V. <u>Best Available Control Technology (BACT)</u>

The BACT requirement applies to each new or modified affected emissions unit and pollutant emitting activity. Also, individual BACT determinations are performed for each pollutant emitted from the same emission unit. Consequently, the BACT determination must separately address, for each regulated pollutant with a significant emissions increase at the source, air pollution controls for each emissions unit or pollutant emitting activity subject to review. Westar was required to prepare a BACT analysis for KDHE's review according to the process described in Attachment A. KDHE's evaluation of the BACT for the proposed Emission Reduction Project's analysis is presented in Attachment B.

KDHE has concurred with Westar for the following:

BACT for Carbon Monoxide is 0.40 lb/MMBtu, thirty day rolling average; BACT for CO is good combustion practices.

KDHE has included the following to the BACT requirement:

The emission limitation established in the permit applies to JEC Unit 3 at all times, including startup, shutdown and malfunction, except as provided in section "VI. Monitoring, Recordkeeping and Reporting, D. Malfunction" of the permit.

VI. Ambient Air Impact Analysis

The owner or operator must demonstrate that allowable emission increases from the proposed facility, in conjunction with all other applicable emissions increases or reductions, would not cause or contribute to air pollution in violation of:

1) any national ambient air quality standard (NAAQS) in any air quality control region; or
2) any applicable maximum allowable increase over the baseline concentration in any area (increment).

Westar used the EPA approved AERSCREEN model to evaluate the impacts of CO that will result from the NO_x Reduction Project at Jeffrey Energy Center Unit 3 for 1-hour CO and 8-hour CO. Westar's evaluation was reviewed by KDHE using EPA's AERSCREEN program, which incorporates the latest version of AERMOD in its calculations.

The emission rate, point location, and stack parameters for the emission source used in the model were based on the data presented in the permit application. Stack parameter data are shown in the table below.

Stack Parameters[1]				
Load	Stack height (ft)	Stack diameter (ft)	Exit temperature (°F)	Exit velocity (ft/s)
100%	574	25.5	125	64.94
75%				50.19
50%				35.64

[1] See also Table D-1 of PSD Permit Application Amendment, submitted December 15, 2011.

After a review of the appropriate satellite imagery and land use data obtained from the U.S. Geological Survey (USGS), it was concluded that the area is "rural" for air modeling purposes.

AERSCREEN estimates concentrations without the need for the user to input meteorological data. The "regulatory default" settings for minimum and maximum temperature, minimum wind speed, and anemometer height were used to determine the meteorology in this model. The meteorology was calculated using the AERMET seasonal tables. The land cover of the area surrounding JEC was analyzed using the 2005 Kansas Land Cover Patterns. This tool shows the primary land cover in the immediate area around JEC is warm-season grassland. Therefore, option number six selection of "Grassland" was used to represent surface characteristics. The dominant surface profile is average moisture since northeast Kansas is not classified as an arid region.

Jeffrey Energy Center Unit 3 stack height exceeds 65 meters; therefore, the model's Building Downwash option was selected and the building dimensions supplied by Westar were used for the model run.

The AERSCREEN program includes averaging time factors for worst-case 1-hour and 8-hour averages. The results from the significance determination indicate that the maximum predicted concentration is expected to be less than the modeling significant impact level (SIL).

Modeled Maximum CO Impact[2]				
Averaging Period	**Maximum Concentration ($\mu g/m^3$)**	**Proposed Emission rate (lb/hr)**	**Modeling SIL ($\mu g/m^3$)**	**Exceeds SIL?**
1-hour	453.90	1466	2,000	No
8-hour	408.50		500	No

For the 1-hour and 8-hour CO averaging periods, the modeled impacts for the proposed facility fall below the modeling SIL. Therefore, no refined modeling is required. The modeling results are also well below the pre-application monitoring threshold of 575 $\mu g/m^3$ for the 8-hour averaging period. There is no pre-application threshold established for the 1-hour averaging period. Therefore, pre-construction monitoring is not required for CO.

[2] See also Appendix D of the PSD permit application.

VII. Additional Impact Analysis

A. Commercial, Residential, and Industrial Growth

The growth analysis considers predicted air quality impacts due to emissions resulting from the commercial, industrial, and residential growth associated with the NO_x Reduction Project. Only permanent growth is considered and impacts from emissions from temporary and mobile sources are not included in the analysis.

There will be no associated growth due to the NO_x Reduction Project. Project construction will be limited and no commercial or residential growth is projected to occur because of this project. Given the temporary nature of the construction and the lack of other source growth in the area, the Project is not expected to cause any adverse construction or growth related air quality impacts

B. Visibility Impairment

Federally designated Class I areas are afforded special protection in the air permitting process. Generally, Class I area visibility analyses are only conducted for projects located within 100 km of a Class I area. The nearest Federal Class I Area is Hercules Glades Wilderness Area in Missouri, over 400 km from the proposed project.

An additional visibility impact analysis may be used to determine if the air emission increases associated with a proposed PSD project will have an impact on Class II sensitive areas such as state parks, wilderness areas, or scenic sites and overlooks. Visibility impairment is a function of the emissions of primary particulate matter, NO_x (including NO_2), elemental carbon (soot), and primary sulfate (SO_4). This project will substantially decrease the emissions of NO_x, thereby improving visibility over current conditions. As CO, not a visibility impairing pollutant, is the only pollutant with an emission increase, the project is not predicted to negatively impact visibility.

A visibility analysis was not required since the proposed project results in a substantial decrease in NO_x emissions and there is no increase in any other visibility-impairing pollutants.

C. Vegetation

Air pollutants can affect vegetation through direct absorption through the foliage, or uptake from the soil of trace elements deposited in the soil. The effects of air pollution on vegetation can include visible damage to foliage and fruit, changes in metabolic function, adverse changes in plant activity, and crop yield reduction. The effects of air pollutants on vegetation fall into three categories: acute (short exposure to high concentration), chronic (lower concentration over months or years), and long term (abnormal changes to ecosystems and physiological alterations in organisms that occur gradually over very long time periods).

Analysis of the land cover of the area surrounding JEC shows the primary land cover in the immediate area around JEC is warm-season grassland. This local area is surrounded by agricultural use, such as corn and soybean farming.

According to EPA publications, there are no reports of measured CO levels producing any adverse effects on plants[3]. In its most recent review of the CO NAAQS, EPA concluded that "the currently available scientific information with respect to non-climate welfare effects, including ecological effects and impacts to vegetation, does not support the need for a CO secondary standard."[4]

The results of the air quality analysis presented in Appendix D of the PSD permit application demonstrate that the maximum ambient air impacts due to the increase in CO emissions from the project will be under the applicable SILs, which are lower than the NAAQS.

CO Modeled Impacts vs. CO NAAQS

Averaging Period	CO NAAQS ($\mu g/m^3$)	Maximum Impact ($\mu g/m^3$)	Percentage of CO NAAQS
1-Hour	40,000	453.90	1.1%
8-Hour	10,000	408.50	4.1%

Therefore, the proposed project is not expected to result in harmful effects to vegetation.

D. Soils

Carbon monoxide (CO) is not known to harm soils, as there is no deposition of CO onto soil. This project will actually decrease NO_x emissions, providing a benefit to the surrounding area.

Therefore, the proposed project is not expected to result in harmful effects to soils.

[3] EPA Air Quality Criteria for Carbon Monoxide (EPA 600/P-99/001F), June 2000, p. 1-1.
[4] Federal Register Volume 76, Number 169, Wednesday, August 31, 2011.

Attachment A

KEY STEPS IN THE "TOP-DOWN" BACT ANALYSIS

STEP 1: IDENTIFY ALL POTENTIAL AVAILABLE CONTROL TECHNOLOGIES.

The first step in a "Top-Down" analysis is to identify, for the emission unit in question, "all available" control options. Available control options are those air pollution control technologies or techniques with a PRACTICAL POTENTIAL FOR APPLICATION to the emissions unit and the regulated pollutant under review. This includes technologies employed outside of the United States. Air pollution control technologies and techniques include the application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant.

STEP 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.

The technical feasibility of the control options identified in Step 1 is evaluated with respect to the source-specific (or emissions unit specific) factors. In general, a demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that difficulties would preclude the successful use of the control option on the emissions unit under review. Technically infeasible control options are then eliminated from further consideration in the BACT analysis.

STEP 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.

All remaining control alternatives not eliminated in Step 2 are ranked and then listed in order of over-all control effectiveness for the pollutant under review, with the most effective control alternative at the top. A list should be prepared for each pollutant and for each emissions unit subject to a BACT analysis. The list should present the array of control technology alternatives and should include the following types of information:

1) control efficiencies;
2) expected emission rate;
3) expected emission reduction;
4) environmental impacts;
5) energy impacts; and
6) economic impacts.

STEP 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.

The applicant presents the analysis of the associated impacts of the control option in the listing. For each option, the applicant is responsible for presenting an objective evaluation of each impact. Both beneficial and adverse impacts should be discussed and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative. The applicant proceeds to consider whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. In the event the top candidate is shown to be inappropriate, due to energy, environmental, or economic impacts, the rationale for this finding should be fully documented for the public record. Then the next most stringent alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the technology cannot be eliminated.

STEP 5: SELECT BACT.

The most effective control option not eliminated in Step 4 is proposed as BACT for the emission unit to control the pollutant under review.

Attachment B

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT'S EVALUATION OF WESTAR ENERGY, INC., JEFFREY ENERGY CENTER UNIT 3 PROPOSED BEST AVAILABLE CONTROL TECHNOLOGY (BACT) OPTIONS

Westar Energy, Inc. (Westar) evaluated the BACT analysis to control emissions from the emission reduction project. The only significant emission increase from this project is Carbon Monoxide (CO).

CO BACT for the Emission Reduction Project

CO controls consist of good combustion practices or an oxidation catalyst. Otherwise, the best identified method to control CO emission from a coal-fired boiler is through the use of appropriate combustion control techniques.

The PSD regulations require BACT, which requires the source to evaluate the control options for technical feasibility. Catalytic oxidation was examined as possible CO control options. Catalytic oxidation was found to be infeasible as a CO control method for the steam generator due to critical technical problems.

No instances of an oxidation catalyst being used to control emission from a gas stream from a coal-fired boiler have been identified. As such, installing an oxidation catalyst to control CO emission was deemed technically infeasible because, in addition to oxidizing CO, an oxidation catalyst will also oxidize a significant portion of SO_2 to SO_3 in the gas stream. SO_3 in the presence of water forms sulfuric acid mist which is highly corrosive to equipment downstream of the catalyst. Also, due to the high amount of PM present in the flue gas stream, the ash acts as a scouring mechanism, plugging and eroding the catalyst after a very brief period of operation, resulting in extremely high operational and maintenance costs to effect more frequent catalysts replacement.

Based on the technical constraints, the use of good combustion practices to meet CO emission levels of 0.40 lb/MMBtu is proposed by Westar as BACT. KDHE agrees with this analysis.